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REMARKS/ARGUMENTS

The amendments and remarks hereto attend to all outstanding issues in the pending office action of 4 January 2006. Claims 1-17 and 25-28 remain pending in this application; of these, claims 12-17 are withdrawn. Claims 1, 7, 8, 12, 16, 17 and 26 are amended. Claim 29 is new.

In the Claims

Claim 1 is amended to clarify that the claimed method is for constructing a preformed solder bar made ready for installing a microchip to a corresponding circuit connection, that a step of forming a solder bar places the microchip in made-ready condition for installation prior to reflowing the solder bar for bonding to the circuit connection, the solder bar presenting an elongate axis parallel to a plane of the footprint, the solder bar filling the footprint. The amendments to claim 1 finds support at paragraphs [0047] and [0048] of the specification as filed, and in FIG. 10D as filed, which shows a microchip with the solder bar in place prior to reflowing the solder bar for bonding to a circuit connection, the solder bar presenting an elongate axis (e.g., horizontal, in FIG. 10D's frame of reference) parallel to a plane of the footprint, the solder bar filling the footprint.

It will be appreciated that the solder bar of claim 1, as is presently claimed, may be as described in claims 12-17, which the Examiner has required to be withdrawn. Claim 1 is accordingly generic, and the allowance of claim 1 will necessitate the inclusion of claims 12-17 in the allowed claims.

Claims 7 and 8 are amended for antecedent consistency with claim 1, and to clarify that a plane of the solder bar is parallel to the socket and to the elongate axis defined in claim 1. The amendments to claims 7 and 9 are also supported by FIG. 10D as filed.

Claims 12, 16, 17 and 26 are amended for consistency with claim 1.

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New claim 29 reads on species 1b of the Examiner's restriction requirement, as it depends from claim 1. Claim 29 is supported in the specification as filed at paragraph [0038]. Claim 29 is believed patentable because it depends from claim 1, argued below as allowable.

No new matter is added to the application through the claim amendments or the new claim herein.

Response to Office Action

Except for the immediately following paragraph, the paragraphs below follow the order of the paragraphs in the Office Action mailed 4 January 2006 in this application.

Office Action Summary

The following paragraph is repeated from the Amendment and Response filed on 24 October 2005 in this application. Applicants note that none of the boxes under item (10) on the Office Action Summary page have been checked off, in the current and all previous Office Actions in this application. We are consequently unable to determine whether the drawings are accepted or objected to by the Examiner, and we request an indication thereof in the next Office Action in this application.

The amended claims address the nature of the rejection, which is strangely semantic in nature. The Examiner relies upon supposed 'admitted prior art' to show a bar that is not actually a bar. Furthermore, the Examiner deems a chip that has been installed to be in condition that is 'made-ready for installation.' For these reasons, the claims have been amended to better define a bar that is a true bar, and the term 'made ready' is also more particularly defined. The fact is everyone understands that the term 'made ready for installation' means made ready prior to installation of the chip on a PCB board or other circuit connection. The fact that this state is now particularly claimed distinguishes the Examiner's position and the art of record.

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Claim Rejections – 35 U.S.C. §102

Claims 1-11 stand rejected under 35 U.S.C. 102(a) as being anticipated by prior art shown in the application ("AAPA"). Applicant respectfully disagrees. To anticipate a claim, the reference must teach every element of the claim and "the identical invention must be shown in as complete detail as is contained in the ... claim." *MPEP 2131* citing *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 2 USPQ2d 1051 (Fed. Cir. 1987) and *Richardson v. Suzuki Motor Co.*, 868 F.2d 1226, 9 USPQ2d 1913 (Fed. Cir. 1989).

Applicants' claim 1, as amended, requires the following step elements in a method of constructing a preformed solder bar for installing a microchip to a corresponding circuit connection:

(1) forming a socket on a first surface of a microchip, such that the socket has predetermined physical dimensions complementary to those of a microchip connection pad footprint occupied by at least one contact pad area on the microchip,

(2) the socket presenting a conductive base capable of bonding to solder; and

(3) forming a solder bar in substantially continuous contact with the conductive base to place the microchip in made-ready condition for installation prior to reflowing the solder for bonding to the circuit connection,

(4) the solder bar presenting an elongate axis parallel to a plane of the footprint, the solder bar filling the footprint.

AAPA does not include, at least, elements (3) and (4) as recited in the claim.

First, element (3) of claim 1 explicitly requires the microchip be "in made-ready condition for installation prior to reflowing the solder for bonding to the circuit connection" and we contend that this is not shown by AAPA. Applicants note the Examiner's statement: "It is the examiner's position that the preformed solder bar chip package "makes it ready" for installation in its ultimate use in the electronic product." Office Action, page 5. The amendment to claim 1 herewith clarifies the claim as

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requiring that the method result in "the microchip in made-ready condition for installation prior to reflowing the solder for bonding to the circuit connection."

Second, we maintain that the Examiner's continued insistence that a solder "ball" is equivalent to the solder "bar" required by element 3 of claim 1 is incorrect. Applicants refer to and repeat the arguments made in the Amendment and Response filed on 24 October 2005 in this application, related to the difference between a "bar" and a "ball."

The Examiner cites an Internet source: "DICTIONARY.COM defines 'bar' as 'a structural or mechanical member.'" in support of an assertion that "the solder ball of AAPA could be considered a solder bar because, inter alia, it is a mechanical member..." Office Action, page 6. Respectfully, we disagree both that the Examiner's citation is proper, and that it says what the Examiner alleges. An Internet dictionary definition may or not remain constant over time and cannot be given the same credence as a printed dictionary, or an online copy of a dictionary that provides traceability as to source and publication date. We cite, for example, Webster's Ninth New Collegiate Dictionary, published 1987:

"**bar** \bär\ *n.* ... 1 **a** : a straight piece (as of wood or metal) that is longer than it is wide and has any of various uses (as for a lever, support, barrier or fastening) **b** : a solid piece or block of material that is usu. rectangular and considerably longer than it is wide **c** : a usu. rigid piece (as of wood or metal) longer than it is wide that is used as a handle or support; esp : a handrail used by ballet dancers..."

Note that all of the main definitions of "bar" include the provision that it is "longer than it is wide."

But even the Internet source cited by the Examiner does not say what the Examiner alleges, for the Examiner has taken isolated words from the source out of context. The entire first definition of "bar" provided by Dictionary.com (at least, as of 1 March 2006) is:

"**bar** ... (bär) *n.* 1. A relatively long, straight, rigid piece of solid material used as a fastener, support, barrier, or structural or mechanical member."

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Thus, the full definition relied on by the Examiner requires a "bar" to be "relatively long" and "straight" - neither of which is true of a "ball." Applicants continue to maintain that, among other reasons why AAPA does not teach the elements of claim 1, a "ball" is simply not a "bar."

Third, element (4) of claim 1, as amended, requires "the solder bar presenting an elongate axis parallel to a plane of the footprint, the solder bar filling the footprint." A "ball" (e.g., an unreflowed solder ball) does not have an elongate axis, while the reflowed solder balls shown in FIG. 2 present an elongate axis in the wrong direction, that is, perpendicular to a plane of the footprint (e.g., a plane formed by UBM 27 where it meets solder ball 3C in FIG. 2).

Since elements (3) and (4), at least, of claim 1 are not found in the prior art, Applicants request the reconsideration and withdrawal of the rejection of claim 1 as anticipated by AAPA under 35 U.S.C. §102(a).

Claims 2-11 depend directly or indirectly from claim 1 and benefit from like arguments. However, these claims have additional reasons for patentability; certain of these reasons were pointed out in the Amendment and Response filed on 24 October 2005 in the present application, with no response by the Examiner in the current Office Action. Applicants therefore reiterate below the previous arguments, with those applying to claims 7 and 8 modified to reflect the amendments herein. We respectfully point out that the Examiner's silence concedes each of the arguments for patentability of claims 2-11 discussed below. *MPEP §707.07(f)*.

Claim 2 requires "the step of forming the socket comprises depositing an adhesion layer onto the wafer, and depositing under-bump-metallization (UBM) material contacting the adhesion layer to complete formation of the conductive base." The Examiner recites the claim elements and references "(figure 2, items 4, 28 and 29)." Office Action, page 2. We respectfully disagree, noting that items 28 and 29 are not an "adhesion layer" or "under-bump metallization (UBM)" but are "BCB layer 28 and passivation layer 29." Specification, paragraph [0035]. In any case, the AAPA does not

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teach a step of depositing the adhesion layer onto the wafer, or depositing UBM material contacting the adhesion layer. As noted with respect to claim 1, the AAPA shows an installed chip; an adhesion layer and/or UBM could have been placed thereon by means other than deposition.

Claim 4, as amended, requires that the step of depositing the UBM material include "depositing a conductor selected from at least one of titanium, tungsten, vanadium, tin, copper, aluminum, gold, silver, and lead." The Examiner recites the claim requirement and references "(specification, paragraph 8)." Office Action, page 3. We disagree because specification paragraph [0008] includes no such teaching:

"[0008] Packages often have different sockets that connect, for example, with low-current, data (I/O) circuits and high-current, power circuits. Both I/O and power circuits utilize solder ball connections. A single solder ball is often inadequate to carry the load of power circuits. Therefore, the load of a power circuit may be shared across a plurality of electrically parallel solder ball connections. Some installations may require additional solder ball connections to provide adequate heat dissipation from the chip." Specification, paragraph [0008].

There is no disclosure in paragraph [0008] or anywhere else in AAPA that teaches that the step of depositing the UBM material includes depositing a conductor selected from at least one of titanium, tungsten, vanadium, tin, copper, aluminum, gold, silver, and lead.

Claim 5, as amended, requires "the step of forming the socket includes forming the socket such that the socket has predetermined dimensions complementary to a microchip connection pad footprint having a geometry selected from the group consisting of rectangular, 'E,' 'L,' and 'U' shapes." Applicants believe that the previously presented amendment to claim 5 overcomes the Examiner's rejection, which is based on the "side profile of item 29." Office Action, page 3. Applicants note that item 29 is a passivation layer, not a microchip connection pad footprint or dimensions complementary to a microchip connection pad footprint.

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Claim 6 requires “the step of forming the socket includes the physical dimensions selected from the group consisting of ring, square, and circular shapes.” The Examiner recites the claim requirement and references “(figure 2, top view of item 20a).” Office Action, page 3. Claim 7, as amended, requires “the step of forming the solder bar comprises forming a solder bar having a planar rectilinear configuration.” The Examiner recites the claim requirement and references “(figure 2, side view of item 20a).” Office Action, page 3. Claim 8, as amended, requires “the step of forming the solder bar comprises forming a solder bar having a planar curvilinear configuration.” The Examiner recites the claim requirement and references “(figure 2, top view of item 20a).” Office Action, page 3.

However, Applicant’s FIG. 2 shows none of the things that the Examiner alleges. FIG. 2 is explicitly a side view, as stated in the specification: “FIG. 2 shows a side view, of the prior art chip scale package 2.” Specification, paragraph [0035]. There is no disclosure of a “top view of item 20a” that the Examiner alleges as support for the rejection of claims 6 and 8. Furthermore, the side view shown in FIG. 2 does not support the Examiner’s contention that “forming a solder bar having a planar rectilinear configuration,” as required by claim 7, is taught. Item 20A is the socket, not a “solder bar.” Item 3A is a solder ball, and is certainly not shown to have a “planar rectilinear configuration” which is taught as “the height dimension extends through a thick film that is substantially planar when the height dimension is several times less, e.g., 4X, 8X, 12X, 16X, less than the width or depth dimension.” Specification, paragraph [0043]. On the contrary, FIG. 2 shows that a height dimension of solder ball 3A is roughly comparable to, or even exceeds, its width.

In addition to the above arguments substantially repeated from the Amendment and Response filed on 24 October 2005 in the present application, claims 7 and 8 have additional reasons for patentability based on the amendments herewith. Each of claims 7 and 8 now require that “a plane of the solder bar is parallel to the socket and the elongate axis.” Applicants point out that in FIG. 2, an elongate axis of each of solder balls 3A, 3B, 3C is perpendicular to, not parallel to, planes of the solder balls.

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Because claims 2-11 depend directly or indirectly from claim 1, and for all of the additional reasons cited above, Applicants request the reconsideration and withdrawal of the rejection of claims 2-11 as unpatentable over AAPA under 35 U.S.C. 102(a).

Claim Rejections – 35 USC §103

The following is a quotation from the MPEP setting forth the three basic criteria that must be met to establish a *prima facie* case of obviousness.

To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the references or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. MPEP §2142, citing *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).

Claims 25 and 26 stand rejected under 35 U.S.C. §103(a) as being unpatentable over AAPA in view of U.S. Patent No. 6,977,396 (“Shen”). Applicant respectfully disagrees and points out that claims 25 and 26 depend from claim 1, argued above as allowable.

Claims 27 and 28 stand rejected under 35 U.S.C. §103(a) as being unpatentable over AAPA in view of U.S. Patent Application Publication No. 2003/0157789 (“Tong”). Applicant respectfully disagrees.

First, claims 27 and 28 depend from claim 2 and from claim 1, both of which are argued above as allowable.

Second, with respect to claim 27, the Examiner asserts: “Tong teaches the adhesion layer can be applied by electroplating and screen printing and the UBM can be applied by sputtering (paragraphs 7 and 32).” Office Action, page 4. The Examiner’s statement is incorrect; the cited passages of Tong do not teach that an adhesion layer can be applied by electroplating or screen printing:

“As shown in FIG. 2, an adhesion layer 120 is formed over the active surface 112 of the wafer 110 by conducting a sputtering operation. The

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adhesion layer 120 covers the bonding pad 116 and the passivation layer 114. Thereafter, a barrier layer 130 is formed over the adhesion layer 120 by conducting a sputtering or an electroplating operation. A wettable layer 140 is formed over the barrier layer 130 by conducting a sputtering or an electroplating operation.” Tong, paragraph [0007], emphasis added.

“As shown in FIG. 9, an adhesion layer 320 is formed over the active surface 312 of the wafer 310 by sputtering or evaporation plating. The adhesion layer 320 covers both the bonding pads 316 and the passivation layer 314. The adhesion layer 320 can be made from a material including, for example, titanium, titanium-tungsten alloy, aluminum or chromium. A barrier layer 330 is formed over the adhesion layer 320 by sputtering, electroplating or evaporation plating. The barrier layer 330 can be made from a material such as nickel-vanadium alloy, for example. A wettable layer 340 is formed over the barrier layer 330 by sputtering, electroplating or evaporation plating.” Tong, paragraph [0032], emphasis added.

Therefore, while Tong teaches forming either of a barrier layer or a wettable layer by sputtering, electroplating or evaporation plating, Tong does not teach or suggest depositing an adhesion layer by one of electroplating and screen printing the adhesion layer, as required by claim 27. Tong is silent on utilizing screen printing, both in the cited paragraphs and elsewhere.

For all of the reasons listed above, Applicants request reconsideration and withdrawal of the rejection of claims 25-28 under 35 U.S.C. §103(a) as unpatentable over AAPA in view of Shen and/or Tong.

Response to Arguments

Applicants appreciate the clarity provided by the Examiner by way of the remarks in the Response to Arguments section. However, Applicants are unsure of which claims are the subject of one remark: “In response to applicant’s argument that the references fail to show certain features of applicant’s invention, it is noted that the features upon which applicant relies (i.e., the chip is placed in this condition before installation) are not recited in the rejected claim(s).” Office Action, page 5. Applicants contend that all of the above arguments refer to features that are recited in rejected claim(s). We request

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clarification from the Examiner if this is inconsistent with the Examiner's position after consideration of the claim amendments submitted herewith.

Conclusion


In view of the above Amendments and Remarks, Applicant has addressed all issues raised in the Office Action dated 4 January 2006, and respectfully solicits a Notice of Allowance. Should any issues remain, the Examiner is encouraged to telephone the undersigned attorney.

The \$395 fee for a Request for Continued Examination is enclosed. No fee for newly-submitted claim 29 is believed due, the new claims bringing the current total claims to twenty-two, with twenty-four claims previously paid for. Applicant believes no other fees are currently due, however, if any fee is deemed necessary in connection with this Amendment and Response, please charge Deposit Account No. 12-0600.

Respectfully submitted,

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